RESEARCH ARTICLE JSLS

Rates of Readmission and Emergency Department Visits of Publicly Versus Commercially Insured Patients in a Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program Accredited Center

Benjamin Clapp, MD, Andres Vivar, BS, Christian Castro, MD, Jisoo Kim, MD, Jesus Gamez, MD, Christopher Dodoo, MS, Brian Davis, MD

ABSTRACT

Background: Patients with governmental insurance are known to utilize the emergency department (ER) at a higher rate and have higher readmission rates than other patients. Twenty percent of our patients are publicly insured. Our objective was to determine if there was a higher rate of readmissions and ER visits within 30 days in publicly insured patients.

Methods: Data was analyzed from a single center submitted to the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program Participant Use Data File from January 1, 2015 to December 31, 2018. We added insurance status and described quantitative variables using mean, and standard deviation (SD). These were reported as regression coefficients (RC) and prevalence ratio (PR), along with their 95% confidence interval (CI). P values of less than 5% were considered statistically significant.

Results: The overall rate of ER visits, readmissions, and reoperations were 3.5%, 7.4%, and 2.2% respectively. Medicaid and Medicare patients were found to have longer operative times, 62.7 minutes vs 57.5 minutes ($p = 0.35$). Patients on public insurance had higher adjusted risk of ER visits (PR 1.43, 95% CI: 0.41–5.3; $p = 0.58$) and readmissions (PR 1.64, 95% CI: 0.76–3.55; $p = 0.21$) than patients on commercial/self-pay insurance. Re-operations were lower in the publicly insured group (PR 0.93, 95% CI: 0.2–4.7; $p = 0.92$) than patients on commercial/self-pay insurance. However, these outcomes were not statistically significant.

Conclusions: Publicly insured patients tend to have a higher adjusted risk of ER visits and readmissions but was not statistically significant. The rate of re-operation was slightly lower in publicly insured patients.

Key Words: Metabolic and Bariatric Surgery, Readmissions, Emergency Room visits, Medicare, Medicaid.

INTRODUCTION

There are over 200,000 metabolic and bariatric surgeries (MBS) performed yearly in the United States.[1] MBS ultimately decreases health care costs but there can be an increase in utilization of healthcare services after surgery. One of the controllable costs may be early readmissions.[2] There has been a push from the American Society of Metabolic and Bariatric Surgeons (ASMBS) to decrease readmissions after surgery. This has been formalized in the Decreasing Readmissions through Opportunities Provided (DROP) program.[3] Readmissions are also a metric that is closely examined during accreditation or reaccreditation for bariatric centers participating in the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP), which is sponsored by the American College of Surgeons (ACS).

Despite the attention focused on decreasing readmissions, not all patients are the same, and there is data that indicates that patients with government sponsored insurance

Department of Surgery, Texas Tech HSC Paul Foster School of Medicine, El Paso, TX. (Dr. Clapp, Castro, Kim, Gamez, Dodoo, and Davis)

Universidad Autónoma de Guadalajara, Guadalajara, Mexico. (Dr. Vivar)

Disclosure: none

Conflict of interests: none.

Funding sources: none

Informed consent: Dr. Benjamin Clapp declares that written informed consent was obtained from the patient/s for publication of this study/report and any accompanying images.

Address correspondence to: Dr. Benjamin Clapp, MD, 1700 N Mesa, El Paso, TX, 79902, Telephone: 915 269-2708, Fax: 915 352-6048, E-mail: b_clapp1@hotmail.com.

DOI: 10.4293/JSLS.2022.00009

(Medicare and Medicaid) have higher utilization of emergency services and higher readmission rates compared to other patients.[4] This is important because although each bariatric program is evaluated using the same criteria, the patient populations vary widely. The MBSAQIP does not take into account the insurance status of the patients undergoing MBS, which may lead to some bariatric programs having higher rates of readmission, emergency department (ER) visits, reoperations, and potentially being penalized unfairly. Our hypothesis was that there would be an increased rate of ER visits and readmissions in Medicaid and Medicare patients undergoing bariatric surgery within 30 days.

METHODS

We used our data from a single institution that was submitted to the MBSAQIP Participant Use Data File (PUF) from January 1, 2015 to December 31, 2018 and added insurance status. Our accredited center has had continuous accreditation, first with the Surgical Review Corporation and later with the ACS, since 2001. It is a private, community-based program. Our inclusion criteria were patients undergoing laparoscopic Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG). Patients who underwent revisional bariatric surgery, incomplete charts, or lack of insurance data were excluded. Our outcomes of interest were readmission, ER visits, re-interventions, and re-operations within 30 days. The standard demographic and patients' characteristics that are reported in the PUF were examined for those patients that were readmitted or had an ER visit within 30 days of surgery. Our institutional review board approved our study.

Quantitative variables were described using mean and standard deviation (SD). For skewed data, median and interquartile range (IQR) was used. Categorical variables were described using frequencies and proportions. To assess the differences across insurance status, the student's t test (Wilcoxon sum rank test for skewed data), and the χ^2 test was used. Linear regression models, along with generalized linear models with a link log and family Poisson, were used to assess the unadjusted and adjusted association. These were reported as regression coefficients (RC) and prevalence ratio (PR), along with their 95% confidence interval (CI). The backward stepwise regression at an entry level of 5% and removal level of 10% was used to assess the variables to be included in the adjusted models. Skewed observations, such as length of stay (LOS), were log-transformed before including them in the model. P values less than 5% were considered statistically significant. All analyses were carried out using STATA v.15.

RESULTS

There were 403 patients that underwent MBS in the study period. Of those, 323 had commercial insurance or were self-funded and 80 were publicly insured (Medicare or Medicaid). Overall, there were 195 SG, 192 RYGB, 10 were lap band removals, and 6 revisions of gastric bypasses. **Table 1** provides a summary description of the entire cohort and by types of insurance.

There were several socioeconomic factors that showed significant differences including mean age at time of surgery including male gender and race. Hispanic race was not considered to be statistically significant in regard to readmission or ER visits. Mean age at time of surgery for the commercial/self-pay group was lower at 43.3 years compared to the government group at 49.5. Male gender (n = 106) in the commercial/self-pay group was higher (28.5%) compared to the government group (17.5%).

Comorbidities were different between the groups. There was a significant difference in the percentage of patients without diabetes mellitus (DM) in the commercial/self-pay group compared to the government group. There were significantly more smokers in the publicly insured group versus the commercial insurance and self-funded group (5% vs 1.2%, $P < .05$). There were significantly more patients with obstructive sleep apnea (OSA) in the commercial/self-pay group at 39.6% compared to the publicly insured group 58.8% ($P < .002$). Publicly insured patients had a higher rate of gastroesophageal reflux disease (GERD) (28.7% vs 12.7% $P < .001$), hypertension (73.8% vs 50.8%, $P < .001$), and hyperlipidemia (38.8% vs 15.2%, $P < .001$). Regarding the choice of procedure by insurance status, the commercial/self-pay group chose the SG at a higher rate than the RYGB (52.6% vs 34%, $P < .002$) than the publicly insured group.

Table 2 shows unadjusted association between selected outcomes and insurance status including the prevalence of ER visits (P = .41), reoperations ($P = .86$), and readmission ($P = .15$). There were no statistically significant differences between the two groups. Publicly insured patients had longer operative times, 62.7 minutes vs 57.5 minutes ($P = .35$), however this association was not statistically significant when adjusted for possible confounders. **Table 3** shows the unadjusted and adjusted association between selected outcomes and insurance status. Publicly insured patients had higher rates of ER visits, readmissions, and

Table 1.
Summary Descriptive of Entire Cohort, and by Types of Insurance

		Insurance Status				
Factor	Cohort	Commercial/ Self Pay	Public	*p*-Value	PR (95% CI)	*p*-Value
N	403	323	80			
Socio - economic / Lab values						
Age at time of surgery, mean (SD)	44.5 (11.4)	43.3 (10.9)	49.5 (11.7)	< 0.001	1.14 (1.08, 1.21)	< 0.001
Body mass index (Highest), mean (SD)	46.1 (7.4)	45.8 (7.1)	47.5 (8.6)	0.077	1.04 (0.99, 1.08)	0.11
Gender: Male	106 (26.3%)	92 (28.5%)	14 (17.5%)	0.046	0.93 (0.86, 0.99)	0.029
Race				0.043		
Black or African American	18 (4.5%)	10 (3.1%)	8 (10.0%)		Reference	
Native Hawaiian or Other Pacific Islander	3 (0.7%)	3 (0.9%)	0 (0.0%)		0.69 (0.59, 0.81)	< 0.001
Unknown/Not Reported	9 (2.2%)	8 (2.5%)	1 (1.3%)		0.77 (0.6, 0.98)	0.035
White	373 (92.6%)	302 (93.5%)	71 (88.8%)		0.82 (0.7, 0.97)	0.02
Hispanic Ethnicity				0.16		
No	110 (27.3%)	95 (29.4%)	15 (18.8%)		Reference	
Unknown	15 (3.7%)	12 (3.7%)	3 (3.8%)		1.06 (0.88, 1.26)	0.55
Yes	278 (69.0%)	216 (66.9%)	62 (77.5%)		1.08 (1, 1.15)	0.038
Comorbidities						
Diabetes Mellitus				< 0.001		
Insulin dependent	45 (11.2%)	28 (8.7%)	17 (21.3%)		Reference	
No	273 (67.7%)	236 (73.1%)	37 (46.3%)		0.82 (0.74, 0.92)	0.001
Non-Insulin dependent	85 (21.1%)	59 (18.3%)	26 (32.5%)		0.95 (0.83, 1.08)	0.41
Current smoker within 1 year	8 (2.0%)	4 (1.2%)	4 (5.0%)	0.031	1.26 (1, 1.59)	0.054
Obstructive Sleep Apnea	175 (43.4%)	128 (39.6%)	47 (58.8%)	0.002	1.11 (1.04, 1.18)	0.002
Gastroesophageal reflux disease (GERD)	64 (15.9%)	41 (12.7%)	23 (28.7%)	0.001	1.16 (1.06, 1.28)	0.001
Hypertension requiring medication	223 (55.3%)	164 (50.8%)	59 (73.8%)	< 0.001	1.13 (1.06, 1.21)	< 0.001
Hyperlipidemia requiring medication	80 (19.9%)	49 (15.2%)	31 (38.8%)	< 0.001	1.2 (1.11, 1.31)	< 0.001
Insurance status						
Insured						
Commercial/ Self Pay	323 (80.1%)					
Government	80 (19.9%)					
Insurance						
Commercial	288 (71.5%)					
Medicaid	30 (7.4%)					
Medicare	50 (12.4%)					
Self-pay	35 (8.7%)					

SD, standard deviation; PR, prevalence ratio; CI, confidence interval.

Table 2.
Unadjusted Association between Selected Outcomes and Insurance Status

		Insurance Status				
Factor	Cohort	Commercial/ Self Pay	Public	*p*-Value	PR (95% CI)**	*p*-Value
N	403	323	80			
Outcomes						
Duration of Surgical Procedure (in minutes), mean (SD)	58.5 (20.1)	57.5 (19.9)	62.7 (20.4)	0.036	5.26 (0.36, 10.15)*	0.035
Hospital Length of Stay (LOS), mean (SD)	1.8 (2.8)	1.8 (3.1)	1.9 (1.0)	0.66	0.16 (-0.54, 0.85)*	0.66
Log of LOS, mean (SD)	0.4 (0.5)	0.4 (0.5)	0.6 (0.4)	< 0.001	0.19 (0.08, 0.3)*	0.001
Hospital Length of Stay, median (IQR)	2.0 (1.0, 2.0)	2.0 (1.0, 2.0)	2.0 (1.0, 2.0)	< 0.001		
Log of LOS, median (IQR)	0.7 (0.0, 0.7)	0.7 (0.0, 0.7)	0.7 (0.7, 0.7)	< 0.001		
Emergency Department Visits	14 (3.5%)	10 (3.1%)	4 (5.0%)	0.41	1.62 (0.52, 5.02)	0.41
Readmission	30 (7.4%)	21 (6.5%)	9 (11.3%)	0.15	1.73 (0.82, 3.64)	0.15
Reoperations within 30 Days	9 (2.2%)	7 (2.2%)	2 (2.5%)	0.86	1.15 (0.24, 5.46)	0.86
Interventions within 30 Days	1 (0.2%)	0 (0.0%)	1 (1.3%)	0.044		
Revision/Conversion	27 (6.7%)	20 (6.2%)	7 (8.8%)	0.41	1.41 (0.62, 3.23)	0.41

RC, regression coefficient; PR, prevalence ratio; CI, confidence interval; LOS, length of stay; IQR, interquartile range.
*RC (95% CI).
**reference group is Commercial/self-pay insurance.

conversions/revisions rates; however, this did not meet statistical significance. The most common cause for readmission was nausea and vomiting. The second most common cause was abdominal pain. There were two readmissions each for intestinal obstructions and bleeding, and one each for pneumonia, deep vein thrombosis, and stricture. Patients on governmental insurance had higher prevalence ratios (PR) of ER visits within 30 days (PR 1.43, 95% CI: 0.41–5.3; $P = .58$) and readmissions (PR 1.64, 95% CI: 0.76–3.55; $P = .21$), but none of these outcomes were statistically significant. Reoperations within 30 days were lower in the publicly insured group (PR 0.93, 95% CI: 00.2–4.7; $P = .92$) than patients on commercial/self-pay insurance.

DISCUSSION

Our results agree with previous literature on publicly insured patients, with a trend towards higher rates of readmission and ER visits, although it was not statistically significant. Overall, our readmission rate of 7.7% is similar to RYGB readmission rates reported for the MBSAQIP at 7.3%.[5] Abraham et al. found a similar rate of 5% overall readmission using the NSQIP database for MBS.[6] We also found that publicly insured patients had longer operative times, longer hospital LOS, and higher rates of DM. An earlier prospective study which included data from January 1, 1998–December 31, 2008 from 183 Medicaid, 77 Medicare, and 570 commercial/self-pay insurances determined that while Medicaid patients had significantly higher BMIs than the Medicare and commercial/self-pay groups and more severe comorbid conditions, the decrease in BMI and resolution of comorbidities was similar after bariatric surgery when adjusted for age, comorbidities, and BMI; there was no difference in short-term outcomes.[7] Another study by Abraham et al. that used data from the Premier database from January 1, 2008–December 31, 2013 and January 1–June 30, 2014 was analyzed using a multivariable logistic regression to predict surgery type, revisions, and readmissions after adjusting for demographics and comorbidities.[8] Between 2008 and the first half of 2014, Premier captured 53,365 patients who underwent RYGB, 30,601 who had SG, and 27,960 who had adjustable gastric banding. Their data suggested that publicly insured patients, regardless of the surgery type, were more likely to be readmitted than patients with managed-care insurance.

A multivariable logistic regression analysis of 217 RYGB patients from a Southern California private practice and

Table 3.
Unadjusted and Adjusted Association between Selected Outcomes and Insurance Status

	PR	95% CI [α]		*p* Value
Duration of Surgical Procedure (in minutes), RC (95% CI)[*]	1.14	-3.21	5.48	0.61
Log of LOS, RC (95% CI)[**]	0.04	-0.04	0.13	0.33
Emergency Department (ED) Visits[***]	1.43	0.41	5.03	0.58
Readmission[****]	1.64	0.76	3.55	0.21
Reoperations within 30 Days[*****]	0.93	0.20	4.27	0.92
Interventions within 30 Days	—	—	—	—
Revision/Conversion[******]	1.46	0.68	3.14	0.33

RC, regression coefficient; PR, prevalence ratio; CI, confidence interval; [α] reference group is commercial/self-pay insurance.
*Adjusted for: procedure, smoking status, hypertension, and sleep apnea.
**Adjusted for: procedure, hyperlipidemia, and sleep apnea.
***Adjusted for: procedure, American Society of Anesthesiologists (ASA) class, and gender.
****Adjusted for: procedure, ASA class, sleep apnea and hyperlipidemia.
*****Adjusted for: procedure.
******Adjusted for: age, hypertension, procedure, gastroesophageal reflux disease, and diabetes mellitus.

124 similar patients from a Philadelphia academic program, under the care of the same surgeon, found that Medicaid status and practice location independently predicted 60-day readmission rate (odds ratio [OR] 30.7, $P < .04$ and OR 50.6, $P < .04$, respectively) and return to ER (OR 30.2, $P = .03$ and OR 160.3, $P < .001$, respectively). Race, income, and the presence of diabetes were not independent predictors.[9] The same surgeon repeated this study in California and followed 1,065 RYGB patients and found Medicare/Medicaid patients to be at higher risk of readmission (OR 10.4, $P > .05$), longer operative times, and prolonged LOS (OR 20.0. $P = .05$).[4]

A study of 450 patients in a single institution at Wisconsin compared patients who received RYGB with readmission for wound infection, malaise, and technical complications (e.g., leak). The study showed that patients readmitted (42 patients; 9%) for wound infection (6 patients; 14%) and malaise (18 patients; 43%) were more likely to have publicly funded insurance. However, there was no difference in insurance status for patients readmitted for technical complications (18 patients: 43%).[10] Another single institution retrospective cohort study was done at Colorado for patients who underwent RYGB between July 1, 2004 and October 31, 2011. The study showed Medicaid patients had higher hospital length of stay ≥ 3 days (OR 2.03; 95% CI 1.09–3.77) and higher likelihood of readmission within 30 days of discharge in patients compared to commercial insurance patients OR 2.84; 95% CI 1.15–6.96).[11] These studies do have limitations of small sample size ($n < 500$), but further support that Medicaid patients may have a higher rate of readmission without significant difference in complications.

The question of readmissions has been studied on the statewide level. Both the New York Statewide Planning and Research Cooperative System (SPARCS) administrative data and the Nationwide Readmissions Database both found that patients being funded by Medicare or Medicaid have higher rates of readmission after bariatric surgery. Our data only looked at 30-day outcomes, but Telem et al. evaluated the New York SPARCS database between January 1, 2006 and December 31, 2008, consisting of 22,139 bariatric patients.[12] One-fourth of this group, who were readmitted within 2 years after undergoing bariatric surgery, were then stratified according to patient characteristics that could potentially anticipate increased odds of readmission. Among these risk factors, Medicare/Medicaid enrollment (OR 10.7, $P < .001$) was a significant readmission predictor. Of note, publicly insured patients undergoing MBS had similar rates as patients with a history of congestive heart failure or substance abuse. At the national level, the Nationwide Readmissions Database sampled 545,377 patients who underwent bariatric surgery between January 1, 2010 and December 31, 2014. It was found that 5.6% of patients had at least one readmission in 30 days after the surgery, and 17.6% of these patients were readmitted to a nonindex hospital (a different hospital from the one they were discharged from). Once again, patient enrollment in Medicare (OR = 1.48, 95% CI

1.24–1.75) and Medicaid (OR = 1.56, 95% CI 1.26–1.95) was associated with higher odds of readmission, specifically at nonindex hospitals.[13]

Overall, our outcomes match the published literature. Our results are from a small cohort of patients in a border county of the United States. They are also from a single institution. Although our results agree with some studies, there are other studies that show the opposite result. Single institution studies will not resolve this controversy and a nationwide study is needed. Although we found a higher rate of ER visits and readmissions, insurance status should not figure into the decision-making process regarding fitness for bariatric surgery. Hopefully, this report will help increase access to bariatric surgery to a vulnerable underserved population.

LIMITATIONS

This main limitation of this study is the limited scope inherent in a single center, retrospective study. The results may not be applicable across the general bariatric population. The number of patients is also relatively small. There may have been patients who did not follow up with the center; however, the MBSAQIP accreditation process guarantees at least an 80% follow up at one month or the center cannot submit its data. Despite this, patients may have gone to an outside ER or been admitted at an outside hospital and may not have shared this with the bariatric center. The nature of the MBSAQIP database and its limitation of 30-day outcomes prevents generalization of these results to longer term outcomes.

CONCLUSION

Publicly insured patients tend to have a higher adjusted risk of ER visits and readmission, but this did not reach statistical significance. The rate of re-operation was slightly lower in publicly insured patients.

References:

1. English WJ, DeMaria EJ, Hutter MM, et al. American Society for Metabolic and Bariatric Surgery 2018 estimate of metabolic and bariatric procedures performed in the United States. *Surg Obes Dis.* 2020;16(4):457–463.

2. Aman MW, Stem M, Schweitzer MA, Magnuson TH, Lidor AO. Early hospital readmission after bariatric surgery. *Surg Endosc.* 2016;30(6):2231–2238.

3. Azagury DE, Morton JM. Patient safety and quality improvement initiatives in contemporary metabolic and bariatric surgical practice. *Surg Clin North Am.* 2016;96(4):733–742.

4. Dallal RM, Trang A. Analysis of perioperative outcomes, length of hospital stay, and readmission rate after gastric bypass. *Surg Endosc.* 2012;26(3):754–758.

5. Kumar SB, Hamilton BC, Wood SG, Rogers SJ, Carter JT, Lin MY. Is laparoscopic sleeve gastrectomy safer than laparoscopic gastric bypass? a comparison of 30-day complications using the MBSAQIP data registry. *Surg Obes Relat Dis.* 2018;14(3):264–269.

6. Abraham CR, Werter CR, Ata A, et al. Predictors of hospital readmission after bariatric surgery. *J Am Coll Surg.* 2015; 221(1):220–227.

7. Alexander JW, Goodman HR, Martin Hawver LR, James L. The impact of Medicaid status on outcome after gastric bypass. *Obes Surg.* 2008;18(10):1241–1245.

8. Abraham A, Ikramuddin S, Jahansouz C, Arafat F, Hevelone N, Leslie D. Trends in bariatric surgery: procedure selection, revisional surgeries, and readmissions. *Obes Surg.* 2016; 26(7):1371–1377.

9. Dallal RM, Bailey L, Guenther L, Curley C, Sergi F. Comparative analysis of short-term outcomes after bariatric surgery between two disparate populations. *Surg Obes Relat Dis.* 2008;4(2):110–114.

10. Hong B, Stanley E, Reinhardt S, Panther K, Garren MJ, Gould JC. Factors associated with readmission after laparoscopic gastric bypass surgery. *Surg Obes Relat Dis.* 2012;8(6):691–695.

11. Jensen-Otsu E, Ward EK, Mitchell B, et al. The effect of Medicaid status on weight loss, hospital length of stay, and 30-day readmission after laparoscopic Roux-en-Y gastric bypass surgery. *Obes Surg.* 2015;25(2):295–301.

12. Telem DA, Talamini M, Gesten F, et al. Hospital admissions greater than 30 days following bariatric surgery: patient and procedure matter. *Surg Endosc.* 2015;29(6):1310–1315.

13. Canner JK, Kaslow SR, Gani F, et al. Incidence of and risk factors associated with care fragmentation following bariatric surgery. *Surg Obes Relat Dis.* 2019;15(7):1170–1181.